







緊子2の感度と、その感度の安定性とを考慮しつつ、これらを容易に調整することができる。そして、可変コンデンサ15によりその容量を調整することができるので、検出素子2の感度、すなわち検出距離1を容易に調整することができる。

【0090】また、静電容量センサ11によれば、前述した静電容量センサ11と同様に、検出素子2が非電板4に対しているので、検出素子2自体の感度が向上し、検出距離1を長くすることができるとともに、外部環境の変動による検出素子2の静電容量の変化量が低減され、これによりS/N比が増大し、静電容量センサ11の検出精度が向上し、また、静電容量センサ11の構型化にも有利である。

【0091】次に、本発明の静電容量センサの第9実施例について述べる。本実施例の静電容量センサは、図9の構成

防止することができる。これにより、検出粒子2の感度が安定し、静電容量センサ1の検出精度が向上する。  
【0086】また、静電容量センサ1によれば、前述した静電容量センサ1と同様に、検出粒子2が帶電板4を介して、検出粒子2の感度が向上し、  
検出距離を、を長くすることができるとともに、外部環境の変動による検出粒子2の静電容量の変化が低減さ  
る。

離しを一定にしたままで、検出器子2の感度を向上させることができるので、電容センサ1 kの導型化にも有利である。なお、本実験では、検出器子2の導電板の数の數は、3以上であつてもよい。

【0.096】ここで導電板の数が多い程、正則に後続されたコントンレンジサンサが多く形成されるので、感度の向上と、検出率の向上という観点からは、導電板の数は多い程、好ましいが、導電板の数が多い程、静電容量センサの厚さ(図12中上下方向の長さ)が大きくなってしまう。これらの事情を考慮すると、検出器子2の導電板の数は、2～10程度が好ましく、2～5程度がより好ましい。

【0.097】また、静電容量センサ1 h以外の各静電容量センサ1 a～1 g、1 iおよび1 jでも、前述した導電板を1 kと同様に、導電板を導電板数倍けるのが好

【0.9.8】本発明の静電容量センサの用途は特に限  
ましい。

【0.9.9】そして、本発明の静電容量センサを近接  
センサに適用される。

【0.9.10】次に、本発明の静電容量センサの具体的実  
例について説明する。

【実施例1】図3に示す静電容量センサ  
bを製造した。諸条件は下記の通りである。

【0102】 [検出電極] 材質 アルミニウム合金 検出面の寸法: 3 cm × 1.5 cm (45.0 cm <sup>2</sup> ) 厚さ: 0.2 cm		【0103】 [帯電板] 検出電極の 検出面の面積 [cm <sup>2</sup> ]	
実験例1	帯電板あり	450	
実験例2	帯電板あり	450	
実験例3	帯電板あり	450	
比較例1	帯電板なし	9	

材質：アルミニウム合金	寸法：3cm×1.5cm (4.50cm <sup>2</sup> )
厚さ：0.2cm	
【0104】 <b>アース電極</b>	材質：アルミニウム合金
寸法：3cm×1.5cm (4.50cm <sup>2</sup> )	厚さ：0.2cm
厚さ：0.2cm	
【0105】 <b>燃出電極、帶電板</b> 持 部材	【0106】 <b>燃出電極と帶電板</b> 持 部材
L <sub>1</sub> ：0.2cm	L <sub>2</sub> ：0.2cm
L <sub>3</sub> ：1.5cm	L <sub>3</sub> ：1.5cm

【01109】 距離1)を2.0cmとしたが、 容量センサ1)を駆動した。	【01109】(実施例3) 図9に示す 1)を駆動した。駆動条件は実施例2と 同様の寸法を3cm×3cm (9cm <sup>2</sup> ) 1)と同様の静電容量センサを構成し 電容量センサの検出距離1)を測定 路6.0の比較器6.6におけるしきい に設定した。また、実施例3の静電 は、可変抵抗13の抵抗値を0Ω 格)とし、可変コンデンサの容量 0.00μFとした。この結果は、下 ある。
【01111】 【01112】 【実】	【01111】 実験例1)と実験例1 【01112】 【実】

1

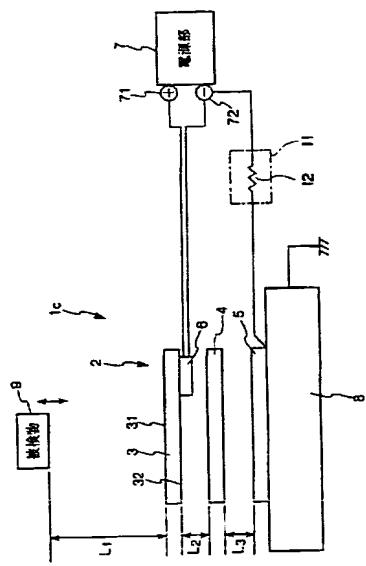
	検出電極の 検出面の面積 [cm <sup>2</sup> ]	L <sub>1</sub> [cm]	可変コンデンサ の容量 [pF]	可変抵抗の 抵抗値 [Ω]	検出距離L <sub>1</sub> [cm]
実施例1 常電版あり	450	1, 5	—	—	3
実施例2 常電版あり	450	2, 0	—	—	4
実施例3 常電版あり	450	2, 0	500	0	8
比較例1 常電版なし	9	—	—	—	2

【0113】上記表1に示すように、実施例1～3の静電容量センサは、供試板を有しているので検出距離が大きい。これに対し、比較例1の静電容量センサは、検出距離が小さい。

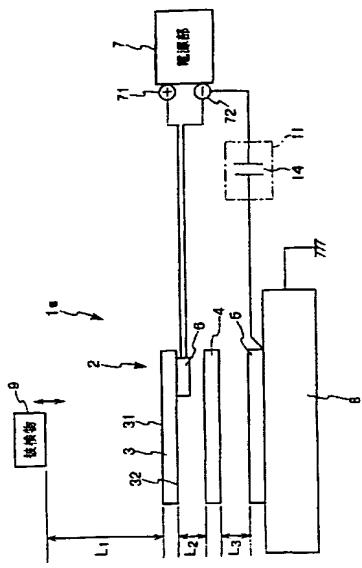


(11)

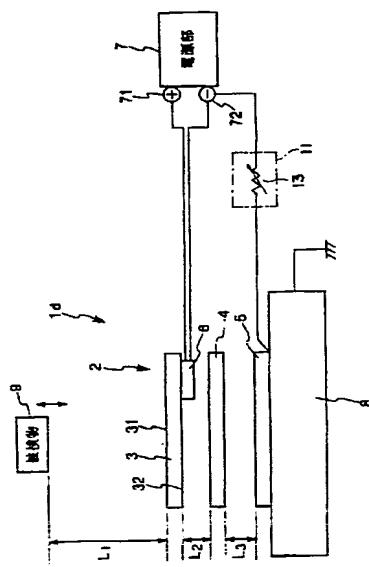
[图4]



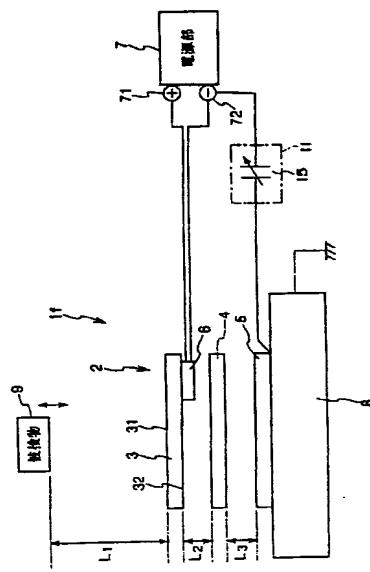
[图6]



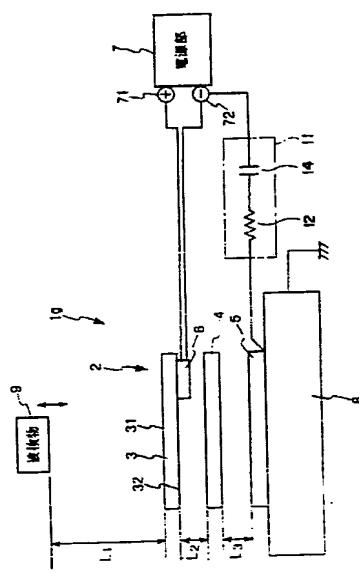
[图5]



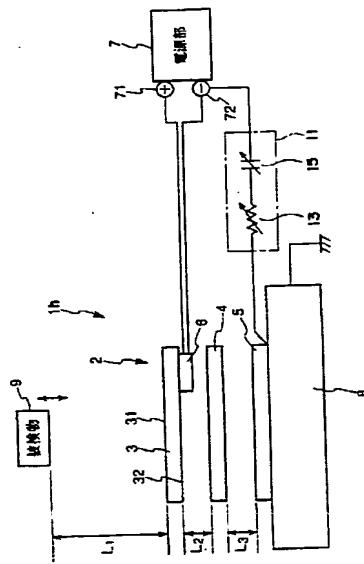
[图7]



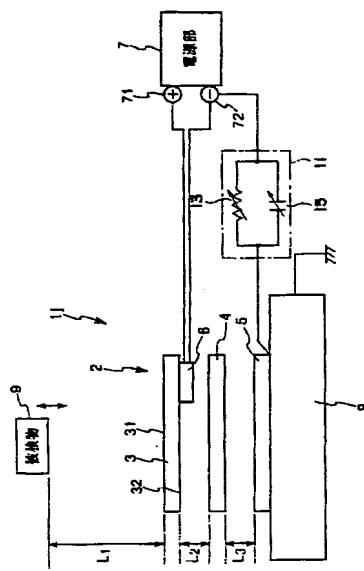
[四八一]



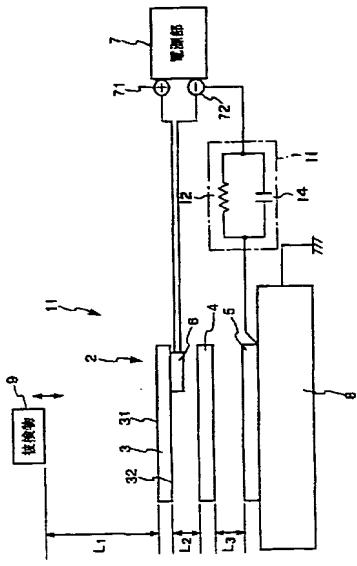
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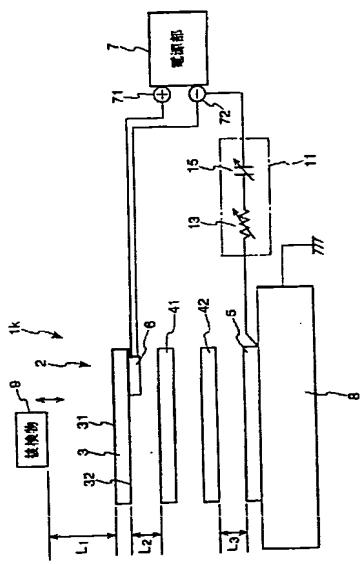
111



101



[图121]



## PATENT ABSTRACTS OF JAPAN

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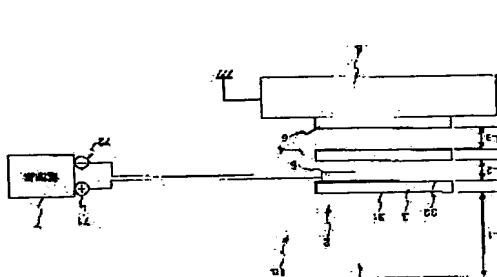
(21)Application number : 08-257775 (71)Applicant : YASHIMA ENGINEERING KK  
(22)Date of filing : 06.09.1996 (72)Inventor : KATO RYOCHI  
KATO HIDETO

## (54) CAPACITANCE SENSOR

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a capacitance sensor having high detection precision and high sensitivity, irrespective of the size of a detection electrode.

SOLUTION: A capacitance sensor 1a is constituted of a capacitance type detection element 1, a circuit board 6 on which a detection circuit is mounted, and a power source part 7. The detection element 2 is constituted of a detection electrode 3, a charged plate 4 and a ground electrode 5. The charged plate 4 is positioned between the detection electrode 3 and the electrode 5. The detection electrode 3, the charged plate 4 and the electrode 5 are arranged in the mutually insulated state, and retained by insulating material (retaining member) in their end portions. The circuit board 6 is arranged on the surface 32 of the detection electrode 3 and insulated from the charged plate 4.



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## CLAIMS

[Claim(s)]  
[Claim 1] The electrostatic-capacity sensor characterized by having the sensing element of the electrostatic-capacity mold arranged where at least one electrification plate of each other located between a detection electrode, a ground electrode, and said detection electrode and ground electrode is insulated, the detector which detects change of the electrostatic capacity of said detection electrode by the specimen, and a power supply section for supplying power to said detector.

[Claim 2] Said ground electrode is an electrostatic-capacity sensor according to claim 1 electrically connected to the minus side edge child of said power supply section.

[Claim 3] Said ground electrode is an electrostatic-capacity sensor according to claim 1 electrically connected to the minus side edge child of said power supply section through the junction circuit.

[Claim 4] The electrostatic-capacity sensor according to claim 3 by which said junction circuit has resistance.

[Claim 5] The electrostatic-capacity sensor according to claim 4 said whose resistance is variable resistance.

[Claim 6] The electrostatic-capacity sensor according to claim 3 to 5 by which said junction circuit has a capacitor.

[Claim 7] The electrostatic-capacity sensor according to claim 6 said whose capacitor is a variable capacitor.

[Claim 8] Said junction circuit is an electrostatic-capacity sensor according to claim 3 which is what has the function to set up the sensibility of an electrostatic-capacity sensor.

[Claim 9] Said junction circuit is an electrostatic-capacity sensor according to claim 3 or 8 which is what has the function which stabilizes the sensibility of an electrostatic-capacity sensor.

[Claim 10] The electrostatic-capacity sensor according to claim 1 to 9 constituted by setup of the distance between said electrification plates and said ground electrodes so that the sensibility of an electrostatic-capacity sensor may be set up.

[Claim 11] The electrostatic-capacity sensor according to claim 1 to 10 by which the distance between said electrification plates and said ground electrodes is set up more greatly than the distance between said detection electrodes and said electrification plates.

[Claim 12] Said detector is an electrostatic-capacity sensor according to claim 1 to 11 currently installed in the opposite side of the detection side of said detection electrode.

[Claim 13] The electrostatic-capacity sensor according to claim 1 to 12 by which two or more electrification plates are arranged along the thickness direction of a sensing element.

[Translation done.]

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## DETAILED DESCRIPTION

## [Detailed Description of the Invention]

## [0001]

[Field of the Invention] This invention relates to an electrostatic-capacity sensor.

## [0002]

[Description of the Prior Art] The electrostatic-capacity sensor which detects approach of the specimen is known. The conventional electrostatic-capacity sensor consists of polar zone and a detector connected to this polar zone. Said polar zone consists of a detection electrode for detecting approach of the specimen, and a ground electrode grounded to the predetermined part.

[0003] By such electrostatic-capacity sensor, if the specimen approaches a detection electrode, since the electrostatic capacity of a detection electrode will increase, a detector detects change of the electrostatic capacity of said detection electrode, and thus senses approach of the specimen.

[0004] However, since the electrostatic capacity of not only the electrostatic capacity of a detection electrode but the whole polar zone, the electrostatic capacity of a detector, etc. are detected, such electrostatic capacity is moreover changed by change of some external environments, such as temperature, humidity, or vibration, by the electrostatic-capacity sensor in fact, and it serves as a noise, detection precision is low. And when an external environment is changed, an electrostatic-capacity sensor may malfunction. Since it changes temperature and humidity sharply according to a season, a time zone or the weather, etc. in using an electrostatic-capacity sensor outdoors especially, detection precision falls further.

[0005] Moreover, that sensibility was unstable while said conventional electrostatic-capacity sensor had the low sensibility of the polar zone itself, and for this reason, it was difficult to lengthen detection distance (only henceforth "detection distance") from a detection electrode to the specimen.

[0006] Fluctuation of the electrostatic capacity of the polar zone by fluctuation of said external environment is large, and since a noise increases by this, the detection precision of an electrostatic-capacity sensor is so low that the area of the detection side of a detection electrode is large especially. And since the threshold in a detector had to be highly set up in order to raise said detection precision when the area of the detection side of a detection electrode was comparatively large, it was difficult to set up detection distance greatly enough.

[0007] [Problem(s) to be Solved by the Invention] The purpose of this invention has sensibility in offering a high electrostatic-capacity sensor highly [detection precision] irrespective of the magnitude of a detection electrode.

[0008] [Means for Solving the Problem] Such a purpose is attained by this invention of following the (1) - (13).

[0009] (1) The electrostatic-capacity sensor characterized by having the sensing element of the electrostatic-capacity mold arranged where at least one electrification plate of each other located between a detection electrode, a ground electrode, and said detection electrode and

ground electrode is insulated, the detector which detects change of the electrostatic capacity of said detection electrode by the specimen, and a power supply section for supplying power to said detector.

[0010] (2) Said ground electrode is an electrostatic-capacity sensor given in the above (1) electrically connected to the minus side edge child of said power supply section.

[0011] (3) Said ground electrode is an electrostatic-capacity sensor given in the above (1) electrically connected to the minus side edge child of said power supply section through the junction circuit.

[0012] (4) An electrostatic-capacity sensor given in the above (3) said whose junction circuit has resistance.

[0013] (5) An electrostatic-capacity sensor given in the above (4) said whose resistance is variable resistance.

[0014] (6) The above (3) said whose junction circuit has a capacitor thru/or an electrostatic-capacity sensor given in either of (5).

[0015] (7) An electrostatic-capacity sensor given in the above (6) said whose capacitor is a variable capacitor.

[0016] (8) Said junction circuit is an electrostatic-capacity sensor given in the above (3) which is variable capacitor.

[0017] (9) Said junction circuit is an electrostatic-capacity sensor given in either of (9).

[0018] (10) The above (1) constituted by setup of the distance between said electrification plates and said ground electrodes so that the sensibility of an electrostatic-capacity sensor may be set up thru/or an electrostatic-capacity sensor given in either of (9).

[0019] (11) The above (1) to which the distance between said electrification plates and said ground electrodes is set more greatly than the distance between said detection electrodes and said electrification plates thru/or an electrostatic-capacity sensor given in either of (10).

[0020] (12) Said detector is an electrostatic-capacity sensor the above (1) currently installed in the opposite side of the detection side of said detection electrode thru/or given in either of (11).

[0021] (13) The above (1) by which two or more electrification plates are arranged along the thickness direction of a sensing element thru/or an electrostatic-capacity sensor given in either of (12).

[0022] [Embodiment of the Invention] Hereafter, the electrostatic-capacity sensor of this invention is explained to a detail based on the suitable example shown in an accompanying drawing.

[0023] Drawing 1 is the side elevation showing the 1st example of the electrostatic-capacity sensor of this invention. As shown in this drawing, electrification plate 1 has the sensing element (polar zone) 2 of an electrification plate (DC power supply) 7. The detector was mounted, and a power supply section (DC power supply) 7.

[0024] The sensing element 2 mainly consists of a detection electrode 3, an electrification plate 4, and a ground electrode 5. The electrification plate 4 is located between the detection electrode 3 and the ground electrode 5, and these detection electrode 3, the electrification plate 4, and the ground electrode 5 are arranged in the condition of having insulated mutually. In this case, as for the detection electrode 3, the electrification plate 4, and the ground electrode 5, it is desirable that it is mutually parallel.

[0025] The detection electrode 3, the electrification plate 4, and the ground electrode 5 are supported by the insulating material (supporter material) which is not illustrated in an edge, respectively. And in this example, the opening is formed between the electrification plate 4 and the ground electrode 5 between the detection electrode 3 and the electrification plates 4,

[0026] In addition, the insulating layer (for example, electric insulating plate) which insulates these mutually may be made to intervene between the detection electrode 3 and the electrification plate 4 in this invention. The insulating layer (for example, electric insulating plate)

which insulates these mutually may be made similarly to intervene between the electrification plate 4 and the ground electrode 5.

[0027] Although especially the configuration of the detection electrode 3 is not limited, it is plate-like in this example. Although the component of the electrification plate 4 will not be limited especially if it is an ingredient which has the function in which charges enough as an electrification plate are charged, various metallic materials or an electrical conducting material is usually used for it. As a component of the electrification plate 4, aluminum, an aluminum alloy, copper, a copper alloy, stainless steel, a copper alloy, stainless steel, an electric conduction film, electrical conductive gum, electric conduction vinyl, etc. are mentioned, for example.

[0028] Moreover, although especially the configuration of the ground electrode 5 is not limited, it is plate-like in this example. Although the component of the electrification plate 4 will not be limited especially if it is an ingredient which has the function in which charges enough as an electrification plate are charged, various metallic materials or an electrical conducting material is usually used for it. As a component of the electrification plate 4, aluminum, an aluminum alloy, copper, a copper alloy, stainless steel, an electric conduction film, electrical conductive gum, electric conduction vinyl, etc. are mentioned, for example.

[0029] Moreover, although especially the configuration of the ground electrode 5 is not limited, it is plate-like in this example. Although the component of the ground electrode 5 will not be limited especially if it is an ingredient which may function as a ground electrode, various metallic materials or an electrical conducting material is usually used for it. As a component of the ground electrode 5, aluminum, an aluminum alloy, copper, a copper alloy, stainless steel, an electric conduction film, electrical conductive gum, electric conduction vinyl, etc. are mentioned, for example. Moreover, as a component of the insulating material mentioned above and an insulating layer, insulating materials, such as various resin ingredients, are mentioned, for example.

[0030] Thus, in electrostatic-capacity sensor 1a, since the sensing element 2 has the electrification plate 4. A capacitor is formed with the detection electrode 3 and the electrification plate 4, according to the amount of charges accumulated in the detection electrode 3, a charge from the detection electrode 3 to the electrification plate 4 or this electrification plate 4 absorbs a charge from the detection electrode 3 to it (the electrification plate 4 functions as the supply / absorption section of the charge to the detection electrode 3). The sensitivity is stabilized while the sensitivity of sensing element 2 the very thing improves by this, since the charge of a constant rate is always quickly supplied and accumulated in the detection electrode 3.

[0031] Moreover, since two capacitors connected to the serial are formed with the detection electrode 3, the electrification plate 4, and a ground electrode, the electrostatic capacity of the part falls and therefore, the noise produced by fluctuation of the electrostatic capacity by fluctuation of an external environment (some external environments, such as temperature, humidity, or vibration) is reduced. That is, the signal over the noise produced by fluctuation of an external environment increases comparatively (S/N ratio), and the detection precision of electrostatic-capacity sensor 1a improves. The circuit board 6 is installed in the field 32 of the opposite side of the detection side 31 of the detection electrode 3. In this case, the circuit board 6 is insulated from the electrification plate 4.

[0032] By installing the circuit board 6 in the field 32 of the detection electrode 3, the circuit board 6 forms a capacitor between the detection side 31 and the electrification plate 4. Since this capacitor constitutes one of two or more capacitors (the specimen 9, the detection electrode 3, the electrification plate 4, two or more capacitors formed in the ground electrode 5 grade) connected to the serial. The variation of the electrostatic capacity of the circuit board 6 by fluctuation of an external environment decreases, and, for this reason, the fall of the detection precision of electrostatic-capacity sensor 1a by fluctuation of an external environment is controlled.

[0033] Moreover, since the circuit board 6 is not formed in the detection side 31 of the detection electrode 3, the detection side 31 can be made into a flat surface. The detector mounted in this circuit board 6 is electrically connected to the plus side edge child 71 and the minus side edge child 72 of a power supply section 7, and power is supplied to said detector

from this power supply section 7. Hereafter, "to connect electrically" is only called "connection." In addition, a detector is explained in full detail behind.

[0034] By the way, the area of the detection side 31 of the detection electrode 3 is 2 30cm. It is especially 100cm above. It is 2 300 morem above. In the case of the electrostatic-capacity sensor which has the above sensing element 2, it is necessary to make still smaller fluctuation of the electrostatic capacity of the detection electrode 3 by fluctuation of an external environment but, and in this invention, since the sensing element 2 has the electrification plate 4, as mentioned above, fluctuation of the electrostatic capacity of the detection electrode 3 by fluctuation of an external environment can be controlled.

[0035] here — the detection distance (only henceforth "detection distance") from the detection side 31 of the detection electrode 3 to the specimen 9 — the distance between L1, the detection electrode 3, and the electrification plate 4 — the distance between L2, the electrification plate 4, and the ground electrode 5 — L3 \*\* — it carries out.

[0036] At electrostatic-capacity sensor 1a, it is the distance L3 between the electrification plate 4 and the ground electrode 5. The sensitivity (sensitivity of electrostatic-capacity sensor 1a) of a sensing element 2 improves, so that it is large, and it is the detection distance L1. It can enlarge. The reason is L3. Since the electrostatic capacity of the capacitor formed with the electrification plate 4 and the ground electrode 5 becomes small so that it enlarges, the discharge by the side of the ground electrode 5 of the charge of the electrification plate 4 is controlled, and the charge of the electrification plate 4 becomes easy to shift to the detection electrode 3 side. Thereby, it is accumulated in the detection electrode 3 quickly [the charge of electrode 3 side], and certainly.

[0037] Distance L2 between the detection electrode 3 and the electrification plate 4 is desirable to be set up greatly, and it is L2. It is more desirable to be set up greatly, such Distance L2 between the detection electrode 3 and the electrification plate 4. It is desirable to be set up greatly and it is L2. It is more desirable to be set up greatly.

[0038] Moreover, at electrostatic-capacity sensor 1a, it is the distance L3 between the electrification plate 4 and the ground electrode 5. It is the detection distance L1 by setup of this sensitivity so that the sensitivity (sensitivity of electrostatic-capacity sensor 1a) of a sensing element 2 may be set up by setup and it may mention later. It is desirable to set up.

[0039] In this case, distance L3 between the electrification plate 4 and the ground electrode 5 Since the detection precision of electrostatic-capacity sensor 1a falls although the sensitivity of a sensing element 2 improves so that it enlarges, these are taken into consideration, and it is L3. It determines suitably. Moreover, it is desirable to make almost the same area of the detection electrode 3, the electrification plate 4, and the ground electrode 5 so that it may be small and the thing of identity ability can be attained.

[0040] In installing such electrostatic-capacity sensor 1a, it fixes the ground electrode 5 to the predetermined part of the installation section 8. In this case, the ground electrode 5 is grounded on the installation section 8 or the earth, or is grounded through installation section 8 grade on the earth.

[0041] Next, the detector of electrostatic-capacity sensor 1a is explained. Drawing 2 is the block diagram showing the example of a configuration of the detector of electrostatic-capacity sensor 1a. As shown in this drawing, the detector 80 consists of the pulse signal generating circuit 61, resistance 62, differential amplifier 64, an AC-DC converter 65 that changes alternating voltage into direct current voltage, and a comparator 66.

[0042] Said pulse signal generating circuit 61, resistance 62, the differential amplifier 64, the AC-DC converter 65, and the comparator 66 are connected in this sequence. The detection electrode 3 is connected to the end side of resistance 62. In addition, an attenuator 63 is constituted by these resistance 62 and the detection electrode 3 (sensing element 2).

[0043] From the pulse signal generating circuit 61, it is an electrical potential difference v1. The pulse signal is outputted. The output signal from this pulse signal generating circuit 61 is inputted into an attenuator 63 and the minus side edge child of the differential amplifier 64, respectively. The electrostatic capacity (electrostatic capacity of a sensing element 2) C of the detection electrode 3 will increase, if the specimen 9 approaches the detection side 31 of the detection electrode 3, and if the specimen 9 keeps away from the detection side 31 of the detection

electrode 3, it will decrease. [0044] In an attenuator 63, the output signal from the pulse signal generating circuit 61 is decreased and outputted according to the value of the electrostatic capacity C of the detection electrode 3. The output signal from this attenuator 63 is inputted into the plus side edge child of the differential amplifier 64. In this case, it is  $V_2$  in the electrical potential difference of the output signal from an attenuator 63, i.e., the one end electrical potential difference of the detection electrode 3. It carries out.

[0045] The differential amplifier 64 is said  $V_1$ ,  $V_2$ . A difference (difference value) is amplified and it is an electrical potential difference  $V_3$ . A signal is outputted. The output signal from this differential amplifier 64 is inputted into the AC-DC converter 65, and is changed into a direct current (direct current voltage) from an alternating current (alternating voltage) in the AC-DC converter 65. In this case, it is the electrical potential difference of the output signal from the AC-DC converter 65.  $V_4$  It carries out.

[0046] The output signal from the AC-DC converter 65 is inputted into this comparator 66, and is compared with the predetermined threshold (reference voltage) set up beforehand. Electrical potential difference  $V_4$ . A signal (H) high-level when larger than a threshold is outputted from a comparator 66, and it is an electrical potential difference  $V_4$ . When it is below a threshold, the signal (L) of a low level is outputted from a comparator 66.

[0047] Here, when the specimen 9 approaches the detection side 31 of the detection electrode 3, the electrostatic capacity C of the detection electrode 3 increases, and thereby, it is the electrical potential difference  $V_2$  of the output signal from an attenuator 63. It decreases. And the output signal from the actuation amplifier 63. It increases and is the electrical potential difference  $V_4$  of the output signal from the AC-DC converter 65. It increases. In this case, electrical potential difference  $V_4$ . The signal (L) of a low level is outputted from a detector 60 until it exceeds a threshold, and it is an electrical potential difference  $V_4$ . If a threshold is exceeded, a high-level signal (H) will be outputted from a detector 60. This detecting signal is used for detection of approach of the specimen 9.

[0048] At this electrostatic-capacity sensor 1a, it is the detection distance L1. It becomes settled with the sensibility of a sensing element 2, and combination with a threshold. This detection distance L1 As for a setup or adjustment, it is desirable that fix a threshold to a predetermined value and a setup and adjustment of the sensibility of a sensing element 2 perform. The reason is as follows.

[0049] In order to enable it to change a threshold, it is the variable resistance for threshold adjustment (variable resistance) to a comparator 66, comparatively large electrostatic capacity - having, although it is necessary to install, fluctuation of the electrostatic capacity which variable resistance has may serve as a noise by fluctuation of an external environment and it may have a bad influence on detection of the electrostatic capacity C of the detection electrode 3. Since said variable resistance of a comparator 66 can be omitted when it fixes a threshold to a predetermined value, generating of the above noises can be controlled and, thereby, the detection precision of electrostatic-capacity sensor 1a improves.

[0050] Since the sensing element 2 has the electrification plate 4 according to electrostatic-capacity sensor 1a as explained above, the sensibility of sensing element 2 the very thing improves, and it is the detection distance L1. While being able to lengthen, the variation of the electrostatic capacity of the sensing element 2 by fluctuation of an external environment is reduced, the signal over a noise increases comparatively (S/N ratio) by this, and the detection precision of electrostatic-capacity sensor 1a improves.

[0051] Next, the 2nd example of the electrostatic-capacity sensor of this invention is explained. Drawing 3 is the side elevation showing the 2nd example of the electrostatic-capacity sensor of this invention. In addition, explanation is omitted about a common feature with electrostatic-capacity sensor 1a mentioned above, and the main differences are explained. [0052] As shown in this drawing, the ground electrode 5 is connected to the minus side edge child 72 of a power supply section 7 in electrostatic-capacity sensor 1b. The other configurations of electrostatic-capacity sensor 1b are the same as that of electrostatic-

capacity sensor 1a mentioned above almost. [0053] In this electrostatic-capacity sensor 1b, compared with the case where the ground electrode 5 is not connected to the minus side edge child 72 of a power supply section 7, a charge can be efficiently discharged from the ground electrode 5, and, thereby, the sensibility of a sensing element 2 improves.

[0054] And the noise which the ground electrode 5 stops the effect of the charge which exists in the air, and influencing substantially of the electrostatic capacity (for example, electrostatic capacity of a mount 8 or its neighborhood) of a before [from the ground electrode 5 / the earth], and is produced by fluctuation of electrostatic capacity is reduced, and, thereby, the detection precision of electrostatic-capacity sensor 1a improves.

[0055] Moreover, since the sensing element 2 has the electrification plate 4 like electrostatic-capacity sensor 1a mentioned above according to this electrostatic-capacity sensor 1b, the sensibility of sensing element 2 the very thing improves, and it is the detection distance L1.

While being able to lengthen, the variation of the electrostatic capacity of the sensing element 2 by fluctuation of an external environment is reduced, a S/N ratio increases by this, and the detection precision of electrostatic-capacity sensor 1b improves.

[0056] Next, the 3rd example of the electrostatic-capacity sensor of this invention is explained. Drawing 4 is the side elevation showing the 3rd example of the electrostatic-capacity sensor of this invention. In addition, explanation is omitted about a common feature with electrostatic-capacity sensor 1b mentioned above, and the main differences are explained.

[0057] As shown in this drawing, in electrostatic-capacity sensor 1c, the ground electrode 5 is connected to the minus side edge child 72 of a power supply section 7 through the junction circuit 11. As for this junction circuit 11, it is desirable to carry out predetermined distance alienation and to arrange from a sensing element 2, so that electrostatic capacity may not be detected by the detector 60. The other configurations of electrostatic-capacity sensor 1c are the same as that of electrostatic-capacity sensor 1b mentioned above almost. The junction circuit 11 of this electrostatic-capacity sensor 1c consists of resistance (resistor) 12.

[0058] Thus, by forming resistance 12 between the ground electrode 5 and the minus side edge child 72, the sensibility of the ground electrode 5 becomes small enough to the sensibility of the detection electrode 3, and it can prevent that the ground electrode 5 functions as a detection electrode. Thereby, the sensibility of a sensing element 2 is stabilized and the detection precision of electrostatic-capacity sensor 1c improves.

[0059] In addition, in electrostatic-capacity sensor 1c, the sensibility of a sensing element 2 is stabilized so that the resistance of resistance 12 is large, but since the sensibility of a sensing element 2 falls, the resistance of resistance 12 is suitably determined in consideration of these.

[0060] Since the sensing element 2 has the electrification plate 4 like electrostatic-capacity sensor 1c, the sensibility of sensor 1b mentioned above according to this electrostatic-capacity sensor 1c, the sensibility of sensing element 2 the very thing improves, and it is the detection distance L1. While being able to lengthen, the variation of the electrostatic capacity of the sensing element 2 by fluctuation of an external environment is reduced, a S/N ratio increases by this, and the detection precision of electrostatic-capacity sensor 1c improves.

[0061] Next, the 4th example of the electrostatic-capacity sensor of this invention is explained. Drawing 5 is the side elevation showing the 4th example of the electrostatic-capacity sensor of this invention. In addition, explanation is omitted about a common feature with electrostatic-capacity sensor 1c mentioned above, and the main differences are explained.

[0062] As shown in this drawing, the junction circuit 11 is constituted from variable resistance (variable resistor) 13 by electrostatic-capacity sensor 1d. Other electrostatic-capacity sensor 1d configurations are the same as that of electrostatic-capacity sensor 1c mentioned above almost.

[0063] In this electrostatic-capacity sensor 1c, these can be adjusted easily, taking into consideration the sensibility and the stability of sensibility of a sensing element 2, since variable resistance 13 can adjust that resistance (adjustable setup).

[0064] Moreover, since the sensing element 2 has the electrification plate 4 like electrostatic-capacity sensor 1c mentioned above according to electrostatic-capacity sensor 1d, the

sensitivity of sensing element 2 the very thing improves, and it is the detection distance L1. While being able to lengthen, the variation of the electrostatic capacity of the sensing element 2 by fluctuation of an external environment is reduced, a S/N ratio increases by this, and the detection precision which is electrostatic-capacity sensor 1d improves.

[0065] Next, the 5th example of the electrostatic-capacity sensor of this invention is explained. Drawing 6 is the side elevation showing the 5th example of the electrostatic-capacity sensor of this invention. In addition, explanation is omitted about a common feature with electrostatic-capacity sensor 1c mentioned above, and the main differences are explained. [0066] As shown in this drawing, the junction circuit 11 is constituted from electrostatic-capacity sensor 1e by the capacitor 14. The other configurations of electrostatic-capacity sensor 1e are the same as that of electrostatic-capacity sensor 1c mentioned above almost. [0067] Thus, the sensitivity of a sensing element 2 improves by forming a capacitor 14 between the ground electrode 5 and the minus side edge child 72. Especially, it is the distance L3 between the electrification plate 4 and the ground electrode 5. L3 [fixing]. Since the sensitivity of a sensing element 2 can be raised without enlarging, it is advantageous to thin-shape-zing of electrostatic-capacity sensor 1e (sensing element 2).

[0068] In electrostatic-capacity sensor 1e, the sensitivity of a sensing element 2 is set up by setup of the capacity of a capacitor 14. And as mentioned above, it is desirable to set up the detection distance L1 by setup of this sensing element 2.

[0069] In this case, the sensitivity of a sensing element 2 improves so that capacity of a capacitor 14 is enlarged, but since the detection precision of electrostatic-capacity sensor 1e falls, in consideration of these, the capacity of a capacitor 14 is determined suitably. [0070] Since the sensing element 2 has the electrification plate 4 like electrostatic-capacity sensor 1c mentioned above according to this electrostatic-capacity sensor 1e, the sensitivity of sensing element 2 the very thing improves, and it is the detection distance L1. While being able to lengthen, the variation of the electrostatic capacity of the sensing element 2 by fluctuation of an external environment is reduced, a S/N ratio increases by this, and the detection precision which is electrostatic-capacity sensor 1e improves.

[0071] Next, the 6th example of the electrostatic-capacity sensor of this invention is explained. Drawing 7 is the side elevation showing the 6th example of the electrostatic-capacity sensor of this invention. In addition, explanation is omitted about a common feature with electrostatic-capacity sensor 1e mentioned above, and the main differences are explained. [0072] As shown in this drawing, the junction circuit 11 is constituted from electrostatic-capacity sensor 1f by the variable capacitor 15. Other electrostatic-capacity sensor 1f configurations are the same as that of electrostatic-capacity sensor 1e mentioned above almost.

[0073] Since a variable capacitor 15 can adjust that capacity in this electrostatic-capacity sensor 1f, it is, the sensitivity L1, i.e., the detection distance, of a sensing element 2. It can adjust easily. [0074] Moreover, since the sensing element 2 has the electrification plate 4 like electrostatic-capacity sensor 1e mentioned above according to electrostatic-capacity sensor 1f. The sensitivity of sensing element 2 the very thing improves, and it is the detection distance L1. While being able to lengthen The variation of the electrostatic capacity of the sensing element 2 by fluctuation of an external environment is reduced, a S/N ratio increases by this, and the detection precision which is electrostatic-capacity sensor 1f improves, and it is advantageous also to thin-shape-zing which is electrostatic-capacity sensor 1f.

[0075] Next, the 7th example of the electrostatic-capacity sensor of this invention is explained. Drawing 8 is the side elevation showing the 7th example of the electrostatic-capacity sensor of this invention. In addition, explanation is omitted about a common feature with electrostatic-capacity sensor 1e mentioned above, and the main differences are explained. [0076] As shown in this drawing, the junction circuit 11 is constituted from electrostatic-capacity sensor 1g by the resistance 12 and the capacitor 14 which were connected to the serial. Other electrostatic-capacity sensor 1g configurations are the same as that of electrostatic-capacity sensor 1e mentioned above almost. In this electrostatic-capacity sensor

1g, the sensitivity of a sensing element 2 improves according to an operation of a capacitor 14 like electrostatic-capacity sensor 1e mentioned above. [0077] And it can prevent that the sensitivity of the ground electrode 5 becomes small enough to the sensitivity of the detection electrode 3, and the ground electrode 5 functions as a detection electrode according to an operation of resistance 12 like electrostatic-capacity sensor 1c mentioned above. Thereby, the sensitivity of a sensing element 2 is stabilized and the detection precision which is electrostatic-capacity sensor 1g improves. [0078] Moreover, since the sensing element 2 has the electrification plate 4 like electrostatic-capacity sensor 1e mentioned above according to electrostatic-capacity sensor 1g. The sensitivity of sensing element 2 the very thing improves, and it is the detection distance L1. While being able to lengthen The variation of the electrostatic capacity of the sensing element 2 by fluctuation of an external environment is reduced, a S/N ratio increases by this, and the detection precision which is electrostatic-capacity sensor 1g improves, and it is advantageous also to thin-shape-zing which is electrostatic-capacity sensor 1g.

[0079] Next, the 8th example of the electrostatic-capacity sensor of this invention is explained. Drawing 9 is the side elevation showing the 8th example of the electrostatic-capacity sensor of this invention. In addition, explanation is omitted about an electrostatic-capacity sensor 1g [which was mentioned above] common feature, and the main differences are explained. [0080] As shown in this drawing, the junction circuit 11 is constituted from electrostatic-capacity sensor 1h by the variable resistance 13 and the variable capacitor 15 which were connected to the serial. Other electrostatic-capacity sensor 1h configurations are the same as that of electrostatic-capacity sensor 1g mentioned above almost. [0081] In this electrostatic-capacity sensor 1h, these can be adjusted easily, taking into consideration the sensitivity and the stability of sensitivity of a sensing element 2, since variable resistance 13 can adjust that resistance. And since a variable capacitor 15 can adjust the capacity, it is, the sensitivity L1, i.e., the detection distance, of a sensing element 2. It can adjust easily.

[0082] Moreover, since the sensing element 2 has the electrification plate 4 like electrostatic-capacity sensor 1h, these can be adjusted easily, taking into consideration the sensitivity of sensing element 2 the very thing improves, and it is the detection distance L1. While being able to lengthen The variation of the electrostatic capacity of the sensing element 2 by fluctuation of an external environment is reduced, a S/N ratio increases by this, and the detection precision which is electrostatic-capacity sensor 1h improves, and it is advantageous also to thin-shape-zing which is electrostatic-capacity sensor 1h. [0083] Next, the 9th example of the electrostatic-capacity sensor of this invention is explained. Drawing 10 is the side elevation showing the 9th example of the electrostatic-capacity sensor of this invention. In addition, explanation is omitted about an electrostatic-capacity sensor 1g [which was mentioned above] common feature, and the main differences are explained. [0084] As shown in this drawing, the junction circuit 11 is constituted from electrostatic-capacity sensor 1i by the resistance 12 and the capacitor 14 which were connected to the juxtaposition. The other configurations of electrostatic-capacity sensor 1i are the same as that of electrostatic-capacity sensor 1g mentioned above almost. In this electrostatic-capacity sensor 1i, the sensitivity of a sensing element 2 improves according to an operation of a capacitor 14 like electrostatic-capacity sensor 1g mentioned above. [0085] And it can prevent that the sensitivity of the ground electrode 5 becomes small enough to the sensitivity of a sensing element 2 improves according to an operation of a sensing electrode according to an operation of resistance 12. Thereby, the sensitivity of a sensing element 2 is stabilized and the detection precision of electrostatic-capacity sensor 1i improves. [0086] Moreover, since the sensing element 2 has the electrification plate 4 like electrostatic-capacity sensor 1i, the detection distance L1 is the same as that of electrostatic-capacity sensor 1h mentioned above according to electrostatic-capacity sensor 1i. The sensitivity of sensing element 2 the very thing improves, and it is the detection distance L1. While being able to lengthen The variation of the electrostatic capacity of the sensing element 2 by fluctuation of an external environment is reduced, a S/N ratio increases by this, and the detection precision of electrostatic-capacity sensor 1i improves.

thin-shape-izing of electrostatic-capacity sensor 1i.

[0087] Next, the 10th example of the electrostatic-capacity sensor of this invention is explained. Drawing 11 is the side elevation showing the 10th example of the electrostatic-capacity sensor 1h of this invention. In addition, explanation is omitted about an electrostatic-capacity sensor 1h [which was mentioned above] common feature, and the main differences are explained.

[0088] As shown in this drawing, the junction circuit 11 is constituted from electrostatic-capacity sensor 1j by the variable resistance 13 and the variable capacitor 15 which were connected to juxtaposition. The other configurations of electrostatic-capacity sensor 1j are the same as that of electrostatic-capacity sensor 1j, these can be adjusted easily, taking into

[0089] In this electrostatic-capacity sensor 1j, these can be adjusted easily, taking into consideration the sensitivity and the stability of a sensing element 2, since variable resistance 13 can adjust that resistance. And since a variable capacitor 15 can adjust the capacity, it is, the sensitivity L1, i.e., the detection distance, of a sensing element 2. It can adjust easily.

[0090] Moreover, since the sensing element 2 has the electrification plate 4 like electrostatic-capacity sensor 1h mentioned above according to electrostatic-capacity sensor 1j. The sensitivity of sensing element 2 the very thing improves, and it is the detection distance L1.

While being able to lengthen the variation of the electrostatic capacity of the sensing element 2 by fluctuation of an external environment is reduced, a S/N ratio increases by this, and the detection precision of electrostatic-capacity sensor 1j improves, and it is advantageous also to thin-shape-izing of electrostatic-capacity sensor 1j.

[0091] Next, the 11th example of the electrostatic-capacity sensor of this invention is explained. Drawing 12 is the side elevation showing the 11th example of the electrostatic-capacity sensor 1h of this invention. In addition, explanation is omitted about an electrostatic-capacity sensor 1h [which was mentioned above] common feature, and the main differences are explained.

[0092] As shown in this drawing, unlike electrostatic-capacity sensor 1h in which the configuration of a sensing element 2 mentioned above electrostatic-capacity sensor 1h almost configurations are the same as that of electrostatic-capacity sensor 1h almost.

[0093] The sensing element 2 of electrostatic-capacity sensor 1h consists of two electrification plates (1st electrification plate) 41, i.e., an electrification plate, and an electrification plate (2nd electrification plate) 42, a detection electrode 3, and a ground electrode 5. In this case, the electrification plates 41 and 42 are arranged along the thickness direction (the drawing 12 Nakagami down) of a sensing element 2 so that the electrification plate 41 may be located in a sensing element 3 side and the electrification plate 42 may be located in the ground electrode 5 side.

[0094] In addition, at electrostatic-capacity sensor 1h, it is the distance between L2, the electrification plate 42, and the ground electrode 5 about the distance between the detection electrode 3 and the electrification plate 41 L3. It carries out. At this electrostatic-capacity sensor 1h, since the 1st capacitor is formed with the detection electrode 3 and the electrification plate 41, the 2nd capacitor is formed with the electrification plate 42 and the ground electrode 5, compared with electrostatic-capacity sensor 1h, a serial has many connection \*\*\* capacitors. For this reason, compared with electrostatic-capacity sensor 1h, the sensitivity of sensing element 2 the very thing improves, and it is the detection distance L1. While being able to lengthen the noise produced by fluctuation of an external environment decreases, and the detection precision which is electrostatic-capacity sensor 1g improves.

[0095] Moreover, in this electrostatic-capacity sensor 1h, these can be adjusted easily, taking into consideration the sensitivity and the stability of a sensing element 2 like electrostatic-capacity sensor 1h mentioned above, since variable resistance 13 can adjust that resistance. And since a variable capacitor 15 can adjust the capacity it is, the sensitivity L1, i.e., the detection distance, of a sensing element 2. It can adjust easily. Moreover, distance L3 between the electrification plate 4 and the ground electrode 5 Since the sensitivity of a sensing element 2 can be raised fixing, it is advantageous also to thin-shape-izing of electrostatic-capacity sensor 1h. In addition, in this invention, the number of the electrification plates of a

sensing element 2 may be three or more.

[0096] Since many capacitors connected to the serial are formed so that there are many electrification plates here, it is so desirable that there are many electrification plates from a viewpoint of improvement of sensitivity and improvement in detection precision, but the thickness (the drawing 12 Nakagami down die length) of an electrostatic-capacity sensor will become large, so that there are many electrification plates. When these situations are taken into consideration, as for the number of the electrification plates of a sensing element 2, two to about ten are desirable, and two to about five are more desirable.

[0097] Moreover, it is desirable to form two or more electrification plates like [each electrostatic-capacity sensors 1a-1g other than electrostatic-capacity sensor 1h, and 1i and 1j] electrostatic-capacity sensor 1k mentioned above.

[0098] Although especially the application of the electrostatic-capacity sensor of this invention is not limited, it is applied to various sensors, such as a proximity switch (non-contact switch), a distance robot, a touch sensor, a displacement gage, and a thickness meter, for example. [0099] And when using the electrostatic-capacity sensor of this invention as a proximity switch, it can prepare in the toilet bowl of an elevator, an escalator, and a toilet, the bumper of a vehicle, a lift device, etc.

[0100] [Example] Next, the concrete example of the electrostatic-capacity sensor of this invention is explained.

[0101] (Example 1) Electrostatic-capacity sensor 1b shown in drawing 3 was manufactured. The terms and conditions are as follows.

[0102] [Detection electrode] — dimension [of an aluminium alloy detection side]: — 3cmx150cm (450cm<sup>2</sup>)

Thickness: 0.2cm [0103] [Electrification plate]  
quality-of-the-material: — aluminium alloy dimension: — 3cmx 150cm (450cm<sup>2</sup>)

Thickness: 0.2cm [0104] [Ground electrode]  
quality-of-the-material: — aluminium alloy dimension: — 3cmx 150cm (450cm<sup>2</sup>)

Thickness: 0.2cm [0105] [Supporter material of a detection electrode, an electrification plate]  
and a ground electrode]  
Quality of the material: Acrylonitrile-butadiene-styrene copolymer (ABS plastics)  
[0106] [Distance L2 between a detection electrode and an electrification plate]  
L2 : 0.2cm [0107] [Distance L3 between an electrification plate and a ground electrode]  
L3 : 1.5cm [0108] (Example 2) Distance L3 between an electrification plate and a ground electrode The same electrostatic-capacity sensor 1b as an example 1 was manufactured except having been referred to as 2.0cm.

[0109] (Example 3) Electrostatic-capacity sensor 1h shown in drawing 9 was manufactured. Terms and conditions are the same as an example 2.

[0110] (Example 1 of a comparison) The same electrostatic-capacity sensor as an example 1 was manufactured except having omitted the electrification plate and having set the dimension of a detection electrode to 3cmx3cm (9cm<sup>2</sup>).  
[0111] Detection distance L1 of the electrostatic-capacity sensor of the *Experiment* examples 1-3 and the example 1 of a comparison It measured. In addition, all the thresholds in the comparator 66 of a detector 60 were set as the same value. Moreover, the resistance of variable resistance 13 is set to 0Ωm (variable resistance 13 is short-circuited) in electrostatic-capacity sensor 1h of an example 3, and it is 500 micro F about the capacity of a variable capacitor. And it could be 1000 micro F. This result is as being shown in the following table 1.

[0112] [Table 1]

表 1

	検出面の面積 [cm <sup>2</sup> ]	L <sub>1</sub> [cm]	可変コンデンサ の容量 [μF]	可変抵抗 抵抗 [Ω]	検出距離 L <sub>1</sub> [cm]
実験例 1 常電板あり	4.50	1. 5	—	—	3
実験例 2 常電板あり	4.50	2. 0	—	—	4
実験例 3 常電板あり	4.50	2. 0	500	0	8
比較例 1 常電板なし	9	—	—	—	2

[Translation done.]

[0113] Since the electrostatic-capacity sensor of examples 1-3 has the electrification plate as shown in the above-mentioned table 1, it is the detection distance L<sub>1</sub>. It is large. On the other hand, the electrostatic-capacity sensor of the example 1 of a comparison is the detection distance L<sub>1</sub>. It is small.

[0114] moreover, the electrostatic-capacity sensor of examples 1-3 --- the area of the detection side of a detection electrode --- 450cm<sup>2</sup> it is --- although --- detection distance L<sub>1</sub> it was fixed and detection precision was high. On the other hand, the electrostatic-capacity sensor of the example 1 of a comparison is the detection distance L<sub>1</sub>, although the area of the detection side of a detection electrode is 2 9cm. There was variation and detection precision was low.

(Example 4)  
[0115] When the electrification plate was installed two along the thickness direction of a sensing element and the same experiment as the above was conducted in said examples 1-3, respectively, it is the detection distance L<sub>1</sub>. It became still larger and detection precision also improved further.

[0116] As mentioned above, although the electrostatic-capacity sensor of this invention was explained based on each example of illustration, this invention is not limited to these. For example, in this invention, a detector 60 is not limited to the thing of the configuration of illustration.

[0117] Moreover, in this invention, a junction circuit 11 shall not be limited to the thing of the configuration of illustration, i.e., the thing which has the function which stabilizes the sensibility of an electrostatic-capacity sensor, and the thing which has the function to set up the sensibility of an electrostatic-capacity sensor, but shall attain the purpose of arbitration. Moreover, in this invention, the circuit board 6 may be installed in parts other than field 32 of the detection electrode 3 (for example, a rear face, a side face, etc. of the installation section 8).

[0118] [Effect of the Invention] While according to the electrostatic-capacity sensor of this invention the sensibility of a sensing element can improve and being able to enlarge detection distance, the variation of the number of electrification direction of a sensing element, compared with the case where the number of electrification plates is one, the sensibility of a sensing element is high, and while being able to enlarge detection distance, the detection precision of an electrostatic-capacity sensor is high.

[0119] When two or more electrification plates are especially arranged along the thickness direction of a sensing element, compared with the case where the number of electrification plates is one, the sensibility of a sensing element is high, and while being able to enlarge detection distance, the detection precision of an electrostatic-capacity sensor is high.

[0120] Moreover, since the discharge by the side of the ground electrode of the charge of an electrification plate is controlled and the charge of an electrification plate becomes easy to shift to a detection electrode side when the distance between an electrification plate and a ground electrode is set up more greatly than the distance between a detection electrode and an electrification plate, the sensibility of a sensing element is high and can enlarge detection

distance.

[0121] Moreover, when the ground electrode is electrically connected to the minus side edge child of a power supply section and the ground electrode is especially connected to the minus side edge child of a power supply section electrically through the junction circuit, compared with the case where the ground electrode is not connected to the minus side edge child of a power supply section, a charge can be efficiently discharged from a ground electrode and, thereby, the sensibility of a sensing element improves. And the noise which a ground electrode stops the effect of the charge which exists in the air, and influencing substantially of the electrostatic capacity of a before [ from a ground electrode / the earth ], and is produced by fluctuation of an electrostatic capacity is reduced, and thereby, the detection precision of an electrostatic-capacity sensor improves.

## \* NOTICES \*

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1. This document has been translated by computer. So the translation may not reflect the original precisely.  
 2. \*\*\* shows the word which can not be translated.  
 3. In the drawings, any words are not translated.

## DESCRIPTION OF DRAWINGS

## [Brief Description of the Drawings]

[Drawing 1] It is the side elevation showing the 1st example of the electrostatic-capacity sensor of this invention.

[Drawing 2] It is the block diagram showing the example of a configuration of the detector in this invention.

[Drawing 3] It is the side elevation showing the 2nd example of the electrostatic-capacity sensor of this invention.

[Drawing 4] It is the side elevation showing the 3rd example of the electrostatic-capacity sensor of this invention.

[Drawing 5] It is the side elevation showing the 4th example of the electrostatic-capacity sensor of this invention.

[Drawing 6] It is the side elevation showing the 5th example of the electrostatic-capacity sensor of this invention.

[Drawing 7] It is the side elevation showing the 6th example of the electrostatic-capacity sensor of this invention.

[Drawing 8] It is the side elevation showing the 7th example of the electrostatic-capacity sensor of this invention.

[Drawing 9] It is the side elevation showing the 8th example of the electrostatic-capacity sensor of this invention.

[Drawing 10] It is the side elevation showing the 9th example of the electrostatic-capacity sensor of this invention.

[Drawing 11] It is the side elevation showing the 10th example of the electrostatic-capacity sensor of this invention.

[Drawing 12] It is the side elevation showing the 11th example of the electrostatic-capacity sensor of this invention.

## [Description of Notations]

1a-1k Electrostatic-capacity sensor

2 Sensing Element

3 Detection Electrode

31 Detection Side

32 Field

4, 41, 42 Electrification plate

5 Ground Electrode

6 Circuit Board

60 Detector

61 Pulse Signal Generating Circuit

62 Resistance

63 Attenuator

64 Differential Amplifier

65 AC-DC Converter

66 Comparator

7 Power Supply Section
71 Plus Side Edge Child
72 Minus Side Edge Child
8 Installation Section
9 Specimen
11 Junction Circuit
12 Resistance
13 Variable Resistance
14 Capacitor
15 Variable Capacitor

[Translation done.]